

**DESCRIPTION****FUNCTIONAL TOOTHBRUSH****Technical Field**

The present invention relates, in general, to functional toothbrushes and, more particularly, to a functional toothbrush in which bristles easily penetrate into gaps between teeth and the efficiency of brushing tooth surfaces is superior.

**Background Art**

Generally, in conventional toothbrushes, a row of bristles is set in each of a plurality of small circular grooves formed on a head part of a toothbrush, as shown in FIG. 1. However, this toothbrush is reduced in productivity and brushing efficiency, and as well, has a poor appearance. To solve the above-mentioned problems, recently, another toothbrush (hereinafter, referred to simply as "first prior art"), in which a row of bristles is set in each of a plurality of longitudinally elongated-rectangular grooves, was proposed.

The toothbrush of the first prior art has several advantages as follow. Because a relatively high number of bristles is set in one elongated-rectangular groove, both the productivity and the efficiency of brushing tooth

surfaces are enhanced. Furthermore, the toothbrush having a superior appearance makes favorable impressions on consumers, thus being popular with the consumers. However, the toothbrush of the first prior art cannot be  
5 manufactured by existing equipment. In detail, a method for manufacturing the typical toothbrushes is that a plurality of bristles is set in each small circular groove having a diameter of approximately 1.6mm and, thereafter, one support pin fastens the bristles in the small circular  
10 groove. However, the equipment used for manufacturing the typical toothbrush cannot manufacture the toothbrush of the first prior art having grooves larger than those of typical toothbrushes.

In the toothbrush of the first prior art, the  
15 bristles of each row are longitudinally arranged in each elongated-rectangular groove. Accordingly, the efficiency of brushing tooth surfaces of a user is superior, but difficulty in penetration into gaps between teeth exists, thereby the health of teeth may be affected.

20 In a detailed description, food residue is held between teeth or between a tooth and a gingiva, as well as adhering to a surface of a tooth. Substantially, food residue held between teeth is a major cause of halitosis, a decayed tooth or a damaged tooth caused by alveolar  
25 pyorrhea.

A correct tooth brushing method is to vertically

brush teeth. By the way, in the case of vertically brushing the teeth using the toothbrush of the first prior art in which the bristles of each row are longitudinally arranged, the bristles cannot easily penetrate into gaps between the 5 teeth. If the user horizontally brushes his/her teeth using the toothbrush of the first prior art, but does not brush vertically, more serious problems may occur. That is, enamel layers on the surfaces of the teeth of the user are damaged. As a result, horizontal streaks may be undesirably 10 formed on the surface of the teeth, due to horizontally brushing and grinding powers increased by the longitudinal arrangement of the bristles.

In the meantime, a method for manufacturing the toothbrush of the first prior art is as follows. Great 15 numbers of monofilaments each having a length of several thousand meters, which correspond to the number of grooves formed on a toothbrush body and are wound around rolls, are arranged in an injection mold. Thereafter, the monofilaments are set in the grooves to form the bristles 20 similar to how a spinning machine weaves cloth and, simultaneously, the set bristles are integrated with the toothbrush body, while a toothbrush is manufactured through an injection molding process. Therefore, the method for manufacturing the toothbrush of the first prior art is 25 problematic in that it is impossible to form bristles below 35mm or less in length.

Moreover, the toothbrush of the first prior art uses typical bristles, but does not use a needle-shaped bristle of which an end is sharp. Hence, the bristles of the toothbrush of the first prior art cannot easily penetrate 5 gaps between teeth or periodontal pockets which are formed on junctions between the teeth and gingivae.

In an effort to overcome the above-mentioned problems, another toothbrush was proposed in Korean Patent Application No. 2001-24978 (hereinafter, referred to simply 10 as "second prior art"), which was filed by the inventor of the present invention. Referring to FIG. 3, in the toothbrush of the second prior art, needle-shaped bristles 3 are set in a plurality of longitudinally elongate grooves 1 which are longitudinally arranged along an outer edge of a 15 head part 11 of a toothbrush body 10. Furthermore, needle-shaped bristles 3 are set in a plurality of latitudinally elongate grooves 1' which are longitudinally arranged on a central portion of the head part 11 of the toothbrush body 10. A method for manufacturing the toothbrush of the second 20 prior art will be described as follows. The longitudinally elongated-rectangular grooves 1 are formed on the outer edge of the head part 11 of the toothbrush body 10. The latitudinally elongated-rectangular grooves 1' are formed on the central portion of the head part 11 of the toothbrush 25 body 10. Thereafter, the needle-shaped bristles 3 are inserted into the longitudinally and latitudinally elongated-

rectangular grooves 1 and 1'. An extended support pin 2 thereafter fastens the needle-shaped bristles 3 in each of the longitudinally and latitudinally elongated-rectangular grooves 1 and 1'. Thereafter, irregular end parts of the 5 needle-shaped bristles 3 are cut off. Ends of remaining parts of the needle-shaped bristles 3 are treated through a grinding process.

By the second prior art, almost all problems of the first prior art are solved. However, because the toothbrush 10 of the second prior art has relatively large elongated-rectangular grooves, lengths of the needle-shaped bristles set in the elongated-rectangular grooves are irregularly formed. Therefore, the toothbrush of the second prior art requires a separate after-treatment, such as cutting and 15 grinding processes. As well, the toothbrush of the second prior art lacks brushing efficiency and penetration and cleaning abilities.

#### Description of Drawings

FIG. 1 is a plan view of a conventional toothbrush 20 having circular grooves;

FIG. 2 is a plan view of another conventional toothbrush having rectangular grooves;

FIG. 3 is a plan view of a further conventional toothbrush having latitudinally and longitudinally elongate 25 grooves in which bristles are set;

FIG. 4 is a sectional view showing a state of a bristle fastened in an elongate groove by a support pin;

5 FIG. 5 is a plan view showing an elongate groove formed on a toothbrush according to a preferred embodiment of the present invention;

FIG. 6 is a plan view of the toothbrush of the present invention;

FIG. 7 is a perspective view of the toothbrush of the present invention;

10 FIG. 8 illustrates that a needle-shaped bristle is set in the toothbrush such that a height difference between both ends of a needle-shaped bristle exists; and

FIGS. 9 through 11 are plan views of toothbrushes, according to other embodiments of the present invention.'

15 **Disclosure**

**Technical Problem**

Accordingly, the present invention has been made keeping in mind the above problems occurring in the second prior art, and an object of the present invention is to 20 provide a toothbrush in which a plurality of needle-shaped bristles that does not require a separate after-treatment is set in a crisscross manner. Another object of the present invention is to provide a toothbrush which has needle-shaped bristles set in a crisscross manner, thus

enhancing brushing efficiency and penetration into gaps between teeth or periodontal pockets which are formed on junctions between the teeth and gingivae, and ability of cleaning the surfaces of the teeth. A further object of the  
5 present invention is to provide a method for manufacturing the toothbrush having needle-shaped bristles set in a crisscross manner which reduces the number of defective products and increases productivity.

### **Technical Solution**

10 In an aspect, the present invention provides a functional toothbrush, including: rows each having needle-shaped bristles (3) set in a longitudinally elongate groove (1) and longitudinally arranged along an outer edge of a head part (11) of a toothbrush body (10); and other rows  
15 each having needle-shaped bristles (3) set in a latitudinally elongate groove (1') and longitudinally arranged on a central portion of the head part (11) of the toothbrush body (10). A length of each of the needle-shaped bristles (3) set in the outer edge of the head part (11) is longer than a length of each of the needle-shaped bristles (3) set in the central portion of the head part (11) by  
20 1.5-3.5mm, and each of the elongate grooves (1, 1') has an elliptical shape.

In another aspect, the present invention provides a  
25 method for manufacturing a toothbrush provided with rows

each having needle-shaped bristles (3) set in a longitudinally elongate groove (1) and longitudinally arranged along an outer edge of a head part (11) of a toothbrush body (10), and other rows each having needle-shaped bristles (3) set in a latitudinally elongate groove (1') and longitudinally arranged on a central portion of the head part (11) of the toothbrush body (10). Each of the elongate grooves (1, 1') formed on the head part (11) has an elliptical shape, and the needle-shaped bristles (3) are set such that a length of each of the needle-shaped bristles (3) set in the elongate groove (1) placed on an outside part of the head part (11) is longer than a length of each of the needle-shaped bristles (3) set in the elongate groove (1') placed on an inside part of the head part (11) by 1.5-3.5mm.

### **Advantageous Effects**

In the toothbrush of the present invention, the great number of needle-shaped bristles is set in each elongate groove, compared with conventional toothbrushes, thus increasing productivity of the toothbrush. Furthermore, the needle-shaped bristles are set in elongate grooves formed on a head part of the toothbrush in a crisscross manner, thus enhancing penetration and cleaning ability. As well, because the needle-shaped bristles are set in each of the elongate grooves such that a length difference exists

between the needle-shaped bristles set in an outer edge and a central portion of the head part, a contact surface between the needle-shaped bristles and teeth is increased, thus enhancing the efficiency of brushing teeth. In addition,  
5 because the elongate grooves each have an elliptical shape, although great numbers of needle-shaped bristles are set in the elongate groove, the needle-shaped bristles have relatively even lengths. Therefore, the present invention does not require cutting and grinding processes which were  
10 executed to manufacture the conventional toothbrushes.

### **Best Mode**

Hereafter, a toothbrush of the present invention will be described in detail.

Molars, cuspids and wisdom teeth, which have the probability of becoming decayed, have rounded outer surfaces. Therefore, if lengths of bristles set in an outer edge of a head part 11 are longer than those of bristles set in a central portion of the head part 11 as the present invention, the contact surface between the bristles and the teeth, each having a rounded shape is increased. As such, when the contact surface between the bristles and the surface of each tooth is increased, brushing efficiency and ability to clean the surface of the tooth are also increased.  
20

25 In the case of vertically brushing the teeth, short

bristles set in the toothbrush in latitudinal directions can readily penetrate between the teeth. Long bristles set in the toothbrush in longitudinal directions can clean the surface of the teeth and, simultaneously, can smoothly 5 penetrate into periodontal pockets which are formed in junctions between the teeth and gingivae. At this time, it is suitable that a length difference between each short bristle and each long bristle ranges from 1.5mm to 3.5mm. If the length difference is beyond the above-mentioned 10 range of 1.5-3.5mm, the contact surface between the bristles and the teeth becomes reduced.

In the present invention, the term "bristles set in a crisscross manner" means that rows having bristles are arranged on the toothbrush in right longitudinal and 15 latitudinal directions and, in addition, the rows may be arranged on the toothbrush to be inclined relative to longitudinal and latitudinal lines of the toothbrush within 30 degrees, that is, in zigzag patterns. In the case that the rows are inclined within the above-mentioned angular 20 range, the toothbrush can achieve the purpose of the present invention.

A needle-shaped bristle means a bristle which decreases in diameter from the bottom to the end, thus being soft, and having superior ability in penetration into 25 gaps between the teeth or between the periodontal pockets formed at junctions between the teeth and gingivae.

Thereby, recently, the needle-shaped bristles have been popular with consumers. In methods for manufacturing the needle-shaped bristle, there are a method of mechanically grinding an end of a bristle and a method of immersing a  
5 bristle in acid or alkali chemical to dissolve its end.

A thickness of an end point of each of the needle-shaped bristles used in the present invention ranges from 0.01mm to 0.03mm. Preferably, various needle-shaped bristles having end points of different thicknesses which  
10 fall within the above-mentioned range are used. Furthermore, the length the tapered part of each of the needle-shaped bristles used in the present invention ranges from 5mm to 12mm. It is also preferable that various needle-shaped bristles having tapers of different lengths  
15 which fall within the above-mentioned range are used. When various needle-shaped bristles having end points of different thicknesses and tapers of different lengths are used, appropriate penetration and superior cleaning ability are demonstrated and, in addition, the life span of the  
20 toothbrush is enhanced. If the thickness of the end point of each of the needle-shaped bristles is less than the above-mentioned thickness range, the cleaning ability is reduced. Otherwise, if the thickness of the end point is above the above-mentioned thickness range, the hardness of  
25 the needle-shaped bristle is increased. Thus, the gingivae of a user may be damaged due to the needle-shaped bristles

while brushing the teeth. In addition, if the length of the tapered part of each of the needle-shaped bristles is under the above-mentioned length range, the hardness of the needle-shaped bristle excessively increases. If the length 5 of the tapered part of each of the needle-shaped bristles is greater than the above-mentioned length range, the cleaning ability is reduced.

A method for manufacturing a conventional toothbrush, which is shown in FIG. 1 and has a plurality of small 10 circular grooves in which a plurality of bristles is set, is very simple. That is, the bristles are set in each of circular grooves and, thereafter, are fastened by a support pin, as shown in FIG. 4. In the conventional toothbrush manufactured through the above-mentioned method, each 15 circular groove has a diameter of about 1.6mm. Therefore, even though an after-treatment is not executed after the bristles are fastened by the support pin, exposed lengths of the bristles set in the circular groove are relatively constant. Thus, the conventional toothbrush manufactured 20 through the above-mentioned method can be directly used without an additional after-treatment.

A method of setting bristles in grooves of a toothbrush of a second prior art is the same as that of the toothbrush of FIG. 1. However, because each groove formed 25 on the toothbrush of a second prior art is relatively large (a length of a minor axis ranges from 1.0mm to 2.0mm, a

length of a major axis ranges from 3.0mm to 4.5mm), an extended support pin having a similar shape as that of the groove must be used to fasten the bristles in the groove. Therefore, in the case that a high number of bristles is  
5 fastened in the groove by using the extended support pin, the lengths of the exposed parts of the bristles set in the toothbrush of the second prior art are different from each other, unlike the conventional toothbrush having the small circular grooves. Hence, in the toothbrush of the second  
10 prior art, after the bristles are set in the grooves, a separate cutting process is executed to even the uneven exposed parts of the bristles. Furthermore, when ends of the exposed parts of the bristles are cut off, thicknesses of remaining ends of the bristles are increased. Thus, a  
15 separate grinding process is required to taper the bristles. As such, because the separate processes are added, workability is reduced. In addition, although the grinding process is executed, thicknesses of end points of the bristles are still relatively large. As a result, the  
20 second prior art is problematic in that the bristles of the toothbrush are rough.

In the toothbrush of the present invention, a plurality of elongate grooves having elliptical shapes is formed in the head part of the toothbrush body. Thus, the  
25 present invention solves the problems associated with the toothbrush of the second prior art. The reason why the

lengths of the bristles of the second prior art are irregularly formed when the bristles are set in the toothbrush is that the grooves of the second prior art are larger than the circular grooves of the conventional  
5 toothbrush. However, a reason more significant than the above-mentioned reason, demonstrated by a repeated test, is that each of the grooves of the second prior art has a rectangular shape. That is, although the elongate grooves of the present invention each have the same size as the  
10 groove of the second prior art, if the elongate groove has an elliptical shape or a predetermined shape similar to an elliptical shape, the problem of the irregular setting of the bristles is solved. The predetermined shape similar to the elliptical shape means that a shape is oblong but each  
15 corner is rounded, as shown in FIG. 5. The toothbrush of the present invention provided through the above-mentioned process is shown in FIGS. 6 and 7.

To enhance penetration of the bristles, each of the needle-shaped bristles is set in each of the elongate grooves after being folded such that a height difference of  
20 0.5-1.5mm exists between both ends of the folded needle-shaped bristle. The needle-shape bristles which are set such that height differences exist between their ends have penetration ability superior to bristles which are set such  
25 that both of their ends are leveled.